

DIGITAL DATA SET

NODULE ANALYSIS DATA

These data are arranged in four sections: station listing, transition metal analyses section, non-transition element analyses section, and bibliography. Data records in the analyses sections are keyed to the station listing by sequence number, and to the bibliography by reference number.

Station Listing

Latitude, Longitude - expressed in degrees and decimal parts of a degree.

Institution (no column heading) - refer to the following code:

FSU - Florida State University

HIG - Hawaii Institute of Geophysics

LDGO - Lamont-Doherty Geological Observatory

OSU - Oregon State University

USSR - Akademiia Nauk, U.S.S.R.

SIO - Scripps Institution of Oceanography

WHOI - Woods Hole Oceanographic Institution

DES and NAR - no function at present.

Transition Metal Analyses

Information on sample type, section of nodule sampled, dimensions, and nodule core material is provided where available.

Analytical method (2-column field immediately following REF column)

Refer to the following code:

WC - Wet chemical

XF - X-ray floorescence spectrometry

XE - X-ray energy spectrometry

EM - Electron microprobe analysis.

AA - Atomic absorption analysis

NA - Neutron activation analysis.

ES - Emission spectroscopy

Data fields containing all zeros indicate "not known".

Non-Transition Element Analyses

"Z" is the atomic number of the element, which is followed by the weight percent of that element in the sample.

DOCUMENTATION for SIO Original Manganese Nodule FileSTA Records Format on SIO File

<u>Item</u>	<u>Beginning Column</u>	<u>Format</u>
Sequence No.	1	A7
-----	8	1X
Ship/Cruise/Station	9	A12
-----	21	1X
Latitude	22	F6.3
Latitude direction	28	A1 (N or S)
-----	29	1X
Longitude	30	F7.3
Longitude direction	37	A1 (E or W)
-----	38	1X
Sample Device	39	A12
-----	51	1X
Water Depth (m)	52	I5
-----	57	1X
Core Length (cm)	58	I5
-----	63	1X
Institution Code	64	A4
-----	68	1X
Reference Code	69	A4
-----	73-75	3X
Surface Lithology Code	76	A2
-----	78	1X
Nodule Occurrence	79	A3 (Yes, No, Nar)
-----	82	1X
Surface Nodules	83	A1 (S)
Buried Nodules	84	A1 (B)
-----	85	1X
Nodule coverage	86	A5
-----	91	1X
Estimate derivation	92	A5
-----	97	1X
Mn Concentration kg/m ²	98	F5.2

XTRA Records Format on SIO File

<u>Item</u>	<u>Beginning Column</u>	<u>Format</u>
Sequence No.	1	A7
Analysis No.	8	A2
-----	10	I1
Depth in Core	11	I5
Z1	16	I3
ZL Concentration	19	F7.4
Z2	26	I3
Z2 Concentration	29	F7.4
Z3	36	I3
Z3 Concentration	39	F7.4
Z4	46	I3
Z4 Concentration	49	F7.4
Z5	56	I3
Z5 Concentration	59	F7.4
Z6	66	I3
Z6 Concentration	69	F7.4
Z7	76	I3
Z7 Concentration	79	F7.4
Z8	86	I3
Z8 Concentration	89	F7.4
Z9	96	I3
Z9 Concentration	99	F7.4
Z10	106	I3
Z10 Concentration	109	F7.4
Z11	116	I3
Z11 Concentration	119	F7.4

NAR Records Format on SIO File

<u>Item</u>	<u>Beginning Column</u>	<u>Format</u>
Sequence No.	1	A7
Analysis No.	8	A2
-----	10	1X
Sample Type Code	11	I2
Section Type Code	13	A2
-----	15	21X
Largest dimension	36	I3
-----	39	1X
Next largest dimension	40	I3
-----	43	1X
Smallest dimension	44	I3
-----	47	1X
Nucleus	48	A7
-----	55	1X
Morphology Code	56	A5
-----	61	1X
SIO Reference Code	62	A4
-----	66	1X
Analytical Method Code	67	A3
-----	70	1X
Mn concentration	71	F5.2
-----	76	1X
Fe concentrations	77	F5.2
CO "	82	F5.2
Ni "	87	F5.2
Cu "	92	F5.2
Zn "	97	F6.3
P6 "	103	F6.2
A1 "	109	F6.2
Si "	115	F6.2
Ca "	121	F6.2
H ₂ O "	127	F6.2

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Non-Transition Element Analyses

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SEQUENCE NUMBER + STATION NO	SHIP/CRUISE	LATI-	LONGI-	SAMPLING	WATER	CORE	REF RECORD
		TUDE	TUDE	DEVICE	DEPTH	LENGTH	NO. NUMBER
1 77,0034 ET7 RD7	61.167S	45.167W	ROCK	DREDGE	232	0.00	FSU A226 1
79,0086 ET5 -RD6	61.233S	67.717W	ROCK	DREDGE	3804	0.00	FSU A227 2
79,0089 ET5 -MT1	61.150S	67.833W	TRawl	DREDGE	4084	0.00	FSU A227 3
79,0087 ET5 -RD7	62.292S	67.850W	ROCK	DREDGE	3705	0.00	FSU A227 4
80,0024 ET10-RD9	62.850S	74.758W	ROCK	DREDGE	4004	0.00	FSU A227 5
8,0030 VEMA17-SBT40	60.125S	74.917W	SEDIMENT	DREDGE	4616	0.00	LDG0 A130 6
80,0039 ET10-RD11	61.033S	75.067W	ROCK	DREDGE	4471	0.00	FSU A227 7
80,0041 ET10 -MT10	62.037S	75.172W	TRawl	DREDGE	4389	0.00	FSU B568 8
8,0062 ET10 -MT19	61.367S	78.933W	TRawl	DREDGE	4544	0.00	FSU B563 9
82,0013 ET17-RD101	62.200S	94.767W	ROCK	DREDGE	4898	0.00	FSU A227 10
82,0014 ET23-RS2	61.450S	94.967W	ROCK	DREDGE	4691	0.00	FSU A227 11
82,0017 ET15 -BT1	61.033S	95.033W	TRawl	DREDGE	4993	0.00	FSU B574 12
82,0027 ET15-RD4	61.033S	99.950W	ROCK	DREDGE	4938	0.00	FSU A227 13
83,0007 ET15 -BT5	61.100S	104.967W	TRawl	DREDGE	4883	0.00	FSU B574 14
84,0013 ET11-MT4	60.260S	114.878W	TRawl	DREDGE	4700	0.00	FSU A227 15
84,0015 ET123-RS5	60.400S	115.017W	ROCK	DREDGE	5033	0.00	FSU A227 16
85,0005 ET13 -BT7	65.617S	123.923W	ROCK	DREDGE	4706	0.00	FSU B571 17
85,0015 ET13 -BT8	63.609S	129.397W	ROCK	DREDGE	4313	0.00	FSU B571 18
86,0006 ET17-PC7-2	61.083S	134.350W	PISTON CORE	4435	0.00	FSU A227 19	
86,0007 ET17-RS5	65.067S	134.883W	ROCK	DREDGE	4298	0.00	FSU A226 20
86,0009 ET17-PC6-1	60.050S	134.917W	PISTON CORE	3804	0.00	FSU A227 21	
86,0010 ET17-RD4	64.050S	135.000W	ROCK	DREDGE	4334	0.00	FSU A227 22
96,0013 ET20-RS6	60.333S	137.767W	ROCK	DREDGE	4243	0.00	FSU A227 23
87,0004 ET25-PC15	64.517S	145.983W	PISTON CORE	3775	0.00	FSU A227 24	
89,0002 ET14-RD5	62.433S	160.117W	ROCK	DREDGE	2926	0.00	FSU A227 25
89,0009 MSN-916	64.183S	165.933W	GRAVITY CORE	2932	1.00	S10 M001 26	
91,0002 MSN-906	63.067S	173.483E	GRAVITY CORE	3583	0.37	S10 M001 27	
91,0003 MSN-12993	60.025S	99.225E	TRawl	DREDGE	4560	0.00	USR A246 28
99,0006 03 12-873	61.075S	98.233E	SEDIMENT	DREDGE	4415	0.00	USR A185 29
11,10004 VEMA 22-102	50.183S	22.400W	PISTON CORE	4319	3.96	LDG0 A108 30	
11,10056 ET3 -MT2	54.183S	27.383W	TRawl	DREDGE	5185	0.00	FSU B566 31
11,20034 VEMA17-SBT84	50.250S	35.883W	TRawl	DREDGE	4702	0.00	LDG0 A130 32
11,30027 ET7 -BT1	55.033S	44.475W	ROCK	DREDGE	3727	0.00	FSU B565 33
11,30062 ET7 -RD16	59.142S	48.883W	ROCK	DREDGE	3850	0.00	FSU A227 34
11,30061 ET7 -PC18	53.042S	43.993W	PISTON CORE	3118	4.20	FSU B565 35	
11,30063 ET7 -RD17	53.058S	48.950W	DREDGE	3255	0.00	FSU B565 36	
11,30068 VE15 -136	52.213S	49.082W	PISTON CORE	2514	7.35	LDG0 B630 37	
11,40005 ET22-FC6	55.900S	51.833W	PISTON CORE	3950	0.00	FSU A227 38	
11,40003 ET22-RS2	57.650S	52.033W	ROCK	DREDGE	3985	0.00	FSU A227 39
11,40013 ET22-PC34	53.383S	52.900W	PISTON CORE	3584	0.00	FSU A227 40	
11,40018 VEMA18-RD11	53.000S	52.900W	DREDGE	3101	0.00	LDG0 A130 42	
11,40021 VEMA18-RD10	54.283S	54.217W	DREDGE	2355	0.00	LDG0 A130 43	
11,40029 VEMA15SBT120	57.530S	55.338W	TRawl	DREDGE	4075	0.00	LDG0 A130 44
11,40040 ET6 -RD10	55.100S	55.833W	ROCK	DREDGE	2871	0.00	FSU A227 45
11,40044 ET6 -BT2	53.942S	55.917W	TRawl	DREDGE	1887	0.00	FSU A227 46
11,40045 ET6 -BT4	57.950S	55.950W	TRawl	DREDGE	4005	0.00	FSU A227 47
11,40046 ET6 -RD13	57.267S	55.962W	ROCK	DREDGE	4064	0.00	FSU A227 48
11,40052 ELTANIN-6-11	55.733S	56.050W	TRIP CORE	3914	0.22	FSU B559 49	
11,40051 ET6 -PC11	55.733S	56.050W	PISTON CORE	3914	5.42	FSU B564 50	
11,40056 ET6 -RD9	54.050S	56.083W	DREDGE	1719	0.00	FSU A227 51	
11,40054 ET6 -RD11	55.975S	56.083W	ROCK	DREDGE	4144	0.00	FSU A227 52
11,40061 ET6 -BT3	56.933S	56.483W	TRawl	DREDGE	3365	0.10	FSU A227 53
11,40062 ET6 -RD12	56.905S	56.517W	ROCK	DREDGE	3127	0.00	FSU A227 54
11,40067 ET22-RS1	57.833S	56.850W	ROCK	DREDGE	3919	0.00	FSU A227 55
11,40081 ET6 RD5	56.267S	58.275W	ROCK	DREDGE	4087	0.00	FSU A226 56
11,40083 ET6 -ML3	56.233S	58.700W	TRawl	DREDGE	4133	0.00	FSU A227 57
SEQUENCE NUMBER + STATION NO	SHIP/CRUISE	LATI-	LONGI-	SAMPLING	WATER	CORE	REF RECORD
		TUDE	TUDE	DEVICE	DEPTH	LENGTH	NO. NUMBER
					(m)	(m)	DES NAR

484.0006	NH-	10	40.235N	155.917W	CORE	5033	0.00	SIO	A077	851	001350	
484.0015	VITYAZ	4104	40.883N	159.898W	TRAWL	DREDGE	5435	0.30	USR	N687	852	001353
486.0012	VITYAZ	4074	40.402N	175.697W	TRAWL	DREDGE	6065	0.00	USR	N637	853	001354
487.0010	JYN-1I-8G		40.483N	172.550E	GRAVITY	CORE	4250	1.65	SIO	M010	854	001356
487.0013	JYNII-9G		40.500N	170.800E	GRAVITY	CORE	5460	0.00	SIO	M015	855	001358
SEQUENCE	SHIP/CRUISE	LATI-	LONGI-	SAMPLING	WATER	COFE	REF	RECORD	REF	REC		
NUMBER + STATION NO.	TUDE	TUDE	DEVICE	DEPTH	LENGTH	NO. NUMBER	DES	NAR				

487.0019	OKADA-K-1	44.500N	170.417E	DREDGE	1280	0.00	A249	85€	001526			
487.0020	OKADA-K-2	44.617N	170.300E		1365	0.00	A249	857	001527			
487.0016	VITYAZ	3151	44.157N	170.117E	TRAWL	DREDGE	5110	0.00	USR	A148	856	001360
487.0018	VITYAZ	3150	44.467N	170.116E	TRAWL	DREDGE	1258	0.00	USR	A178	859	001361
5190054	GA-3	56.167N	145.250W	DREDGE	0	0.00	A165	860	001362			
5200002	GILBERT SMT.	52.783N	150.083W	DREDGE	0	0.00	A165	861	001363			

O indicates "not known"

SEQ. NO., SAMP. TYPE & SEC1 SAMPLED DIMENSIONS CORE

SEQ. NO.	SAMP.	TYPE	SEC1	SAMPLED	DIMENSIONS	CORE	MORPH.	REF	MN	FE	CO	NI	CU	ZN	FB	AL	SI	CA	H2O
770031	0				(M)	(M)													
790086	0						A227	1.00	7.10	0.10	0.14	0.10	0.030	0.00	0.00	0.00	0.00	3.60	
790089	0						A227	1.00	11.20	0.13	0.05	0.11	0.040	0.00	0.00	0.00	0.00	5.00	
790090	0						A227	1.00	8.30	0.12	0.06	0.12	0.030	0.00	0.00	0.00	0.00	1.90	
800024	0						A227	1.00	10.00	0.08	0.08	0.06	0.13	0.039	0.00	0.00	0.00	4.80	
820013	0						A227	1.00	8.90	0.11	0.07	0.10	0.033	0.00	0.00	0.00	0.00	3.60	
800030	0	NODEL					A179	WC	6.30	10.90	0.11	0.12	0.07	0.000	0.00	0.00	0.00	0.00	
800039	0						A227	2.30	13.50	0.24	0.18	0.12	0.040	0.00	0.00	0.00	0.00	8.50	
800041	0						A227	7.50	14.80	0.23	0.30	0.13	0.050	0.00	0.00	0.00	0.00	10.20	
800062	0						A227	4.39	14.80	0.30	0.18	0.08	0.040	0.00	0.00	0.00	0.00	11.20	
820013	0						A227	11.30	9.10	0.15	0.56	0.34	0.045	0.00	0.00	0.00	0.00	9.50	
820014	0	NODEL	OUTER LAYER				A227	1.30	18.00	0.33	0.22	0.15	0.040	0.00	0.00	0.00	0.00	14.60	
820014	1	NODEL	OUTER LAYER				A227	12.20	18.30	0.32	0.22	0.14	0.040	0.00	0.00	0.00	0.00	15.10	
820017	0						A227	1.00	8.20	0.10	0.20	0.17	0.039	0.00	0.00	0.00	0.00	6.30	
920027	0						A227	4.90	10.50	0.11	0.37	0.21	0.039	0.00	0.00	0.00	0.00	10.10	
830007	0						A227	11.90	15.80	0.22	0.33	0.15	0.044	0.00	0.00	0.00	0.00	17.60	
830007	1						A227	12.80	20.80	0.22	0.27	0.07	0.059	0.00	0.00	0.00	0.00	22.00	
840013	0						A227	10.20	16.90	0.23	0.22	0.16	0.043	0.00	0.00	0.00	0.00	16.40	
840015	0	NODEL	OUTER LAYER				A227	16.40	17.60	0.31	0.29	0.13	0.040	0.00	0.00	0.00	0.00	18.60	
840015	1	NODEL	X-SECTION				A227	13.60	19.50	0.39	0.21	0.11	0.030	0.00	0.00	0.00	0.00	17.80	
850005	0						A227	4.20	9.90	0.15	0.39	0.23	0.044	0.00	0.00	0.00	0.00	9.30	
850015	0						A227	11.40	14.20	0.20	0.44	0.19	0.051	0.00	0.00	0.00	0.00	14.80	
860006	0	NODEL	OUTER LAYER				A227	22.40	10.60	0.11	0.86	0.56	0.100	0.00	0.00	0.00	0.00	18.10	
860007	0						A227	10.80	16.60	0.25	0.46	0.25	0.050	0.00	0.00	0.00	0.00	7.70	
860009	0	NODEL	OUTER LAYER				A227	11.70	23.80	0.28	0.13	0.21	0.050	0.00	0.00	0.00	0.00	18.50	
860009	1	NODEL	OUTER LAYER				A227	12.60	23.60	0.28	0.12	0.17	0.060	0.00	0.00	0.00	0.00	19.60	
860010	0						A227	9.80	16.60	0.27	0.29	0.19	0.052	0.00	0.00	0.00	0.00	7.30	
860010	1						A227	11.30	16.00	0.27	0.41	0.20	0.056	0.00	0.00	0.00	0.00	14.10	
860013	0	NODEL	OUTER LAYER				A227	18.90	10.40	0.08	1.00	0.58	0.110	0.00	0.00	0.00	0.00	17.10	
870004	0						A227	18.10	17.30	0.57	0.29	0.09	0.040	0.00	0.00	0.00	0.00	19.60	
890002	0						A227	6.30	18.20	0.14	0.27	0.10	0.065	0.00	0.00	0.00	0.00	12.00	
890009	0	CRUST X-SECTION		15			A197	14.80	11.00	0.17	0.70	0.29	0.100	0.15	2.40	11.30	1.52	17.40	
890009	1	NODEL X-SECTION					A197	14.20	10.80	0.15	0.68	0.36	0.120	0.15	2.50	13.00	1.44	0.60	
910002	0	CRUST X-SECTION		15			A197	8.80	12.40	0.14	0.27	0.13	0.058	0.14	3.90	15.50	1.79	12.20	
910005	0	NODEL OUTER LAYER					A227	18.40	15.50	0.27	0.64	0.24	0.100	0.00	0.00	0.00	0.00	19.80	
910005	1	CRUST OUTER LAYER					A227	13.50	22.40	0.33	0.20	0.08	0.060	0.00	0.00	0.00	0.00	19.10	
990053	0	CRUST OUTER LAYER					A227	12.10	23.00	0.35	0.13	0.08	0.050	0.00	0.00	0.00	0.00	20.40	
990006	0	NODEL					A246	2.20	12.22	0.00	0.13	0.00	0.000	0.00	0.00	0.00	0.00		
1110004	0						A246	3.93	5.65	0.00	0.04	0.02	0.000	0.00	0.00	0.00	0.00		
1110004	0						A179	12.00	5.30	0.03	0.38	0.27	0.000	0.00	0.00	0.00	0.00		
1110056	0						A227	1.00	5.80	0.08	0.52	0.35	0.052	0.00	0.00	0.00	0.00		

FILE 2

4840006	3	NUODULE, WHOLE	0.25	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4840015	0	NUODULE, OUTER LAYER	1.30	11.60	0.25	0.40	0.00	0.00	0.00	0.00	0.00
4860012	0	NUODULE, OUTER LAYER	1.30	8.92	0.31	0.43	0.30	0.00	4.04	14.77	1.93
4870010	0	NUODULE, HALF	1.20	10.70	0.13	0.22	0.17	0.00	4.34	14.42	1.87
4870010	1	NUODULE, WHOLE	1.00	11.27	0.07	0.30	0.17	0.00	0.01	0.00	0.00
4870013	1		0.93	12.40	0.48	0.20	0.21	0.056	0.13	3.50	16.50
4870019	0	NUODULE, WHOLE	9.00	8.5X3.0	NONE	A189	6.97	12.77	0.15	0.22	0.12
4870020	0	NUODULE, WHOLE	8.50	8.0X5.0	NONE	A249	30.30	8.63	0.42	0.24	0.04
4870016	0	NUODULE	9.74	13.55	0.09	A249	22.70	9.27	0.28	0.62	0.05
4870016	1	NUODULE, HALF	8.20	14.00	0.06	A178	9.74	13.55	0.14	0.05	0.00
4870018	0	NUODULE, OUTER LAYER	8.20	14.00	0.06	A261	ES	0.09	0.10	0.00	0.11
5190054	0					A178	33.90	7.80	0.41	0.42	0.03
5190054	1	CRUST	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
5200002	0					A255	20.90	13.40	0.40	0.37	0.00
8000024	0	22.0.46.00.42.0.0150.23.0.0440.38.0.0630.40.0.0290.50.0.030.56.0.0460	19.40	14.80	0.31	A165	19.40	14.80	0.32	0.21	0.00

NOTE ALL DIMENSIONS ARE IN MILLIMETERS EXCEPT THOSE MARKED BY AN ASTERISK (*). WHICH ARE IN MICRONS.

SEQ NO. Z WT: Z WT:

FILE 3

770031	0	22.0.34.00.42.0.0120.23.0.0100.38.0.0300.40.0.0280.50.0.0030.56.0.0130	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
790086	0	22.0.53.00.42.0.0140.23.0.0220.38.0.0600.40.0.0680.50.0.0050.56.0.0420	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
790089	0	22.0.41.00.42.0.0130.23.0.0510.38.0.0540.40.0.0500.50.0.0150.56.0.0250	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
790090	0	22.0.36.00.42.0.0190.23.0.0770.38.0.0620.40.0.0600.50.0.0060.56.0.0430	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
800039	0	22.0.54.00.42.0.0180.23.0.0330.38.0.0720.40.0.0390.50.0.0030.56.0.0800	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
800041	0	22.0.66.00.42.0.0200.23.0.0660.38.0.0780.40.0.0820.50.0.0070.56.0.0840	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
800062	0	22.0.69.00.42.0.0250.23.0.0500.38.0.0870.40.0.0900.50.0.0030.56.0.1160	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
820013	0	22.0.57.00.42.0.0290.23.0.0100.38.0.0750.40.0.0400.50.0.0100.56.0.1000	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
820014	0	22.0.81.00.42.0.0320.23.0.0810.38.0.0910.40.0.0480.50.0.0280.56.0.0450	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
820017	0	22.0.40.00.42.0.0180.23.0.0300.38.0.0570.40.0.0710.50.0.0100.56.0.0580	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
820027	0	22.0.57.00.42.0.0240.23.0.0100.38.0.0650.40.0.0620.50.0.0070.56.0.0740	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
830007	0	22.0.65.00.42.0.0320.23.0.0230.38.0.0840.40.0.1220.50.0.0040.56.0.0940	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
830007	1	22.0.83.00.42.0.0290.23.0.0380.38.0.1090.40.0.1960.50.0.0040.56.0.1100	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
840013	0	22.0.76.00.42.0.0350.23.0.0190.38.0.0890.40.0.1170.50.0.0040.56.0.1280	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
840015	0	22.0.81.00.42.0.0250.23.0.0330.38.0.1380.40.0.0690.50.0.0090.56.0.1170	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
840015	1	22.0.92.00.42.0.0430.23.0.0410.38.0.1290.40.0.0670.50.0.0110.56.0.0800	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
850005	0	22.0.84.00.42.0.0250.23.0.0160.38.0.0600.40.0.0500.50.0.0070.56.0.0620	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
850015	0	22.0.64.00.42.0.0310.23.0.0320.38.0.0780.40.0.1050.50.0.0050.56.0.0940	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
860006	0	22.0.49.00.42.0.0350.23.0.0590.38.0.0920.50.0.0700.56.0.1200	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
860013	0	22.0.98.00.42.0.0300.23.0.0200.38.0.0920.40.0.0700.50.0.0100.56.0.1200	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
860009	0	22.0.88.00.42.0.0510.23.0.0450.38.0.1230.40.0.1550.50.0.0080.56.0.1820	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
870004	0	22.0.91.00.42.0.1260.23.0.0560.38.0.1290.40.0.0760.50.0.0080.56.0.1230	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
990002	0	22.0.86.00.42.0.0150.23.0.0300.38.0.0800.40.0.1310.50.0.0040.56.0.0860	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
890009	0	22.0.63.00.42.0.0110.23.0.0100.38.0.1000.50.0.0100.56.0.1200	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
910002	0	22.0.46.00.42.0.0050.23.0.0100.38.0.0100.50.0.0200.56.0.2500	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
910005	0	22.1.03.00.42.0.0510.23.0.0970.38.0.1320.40.0.0640.50.0.0150.56.0.1290	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
910005	1	22.0.78.00.42.0.1120.23.0.1230.38.0.1310.40.0.0090.50.0.0080.56.0.1730	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00
910005	2	22.1.16.00.42.0.0620.23.0.0920.38.0.1330.40.0.0550.50.0.0130.56.0.2830	20.20	13.07	0.26	A165	20.20	13.07	0.45	0.40	0.00

4810492 1 22 0.1200 57 0.0110 70 0.0035
 4810504 1 22 0.5700 42 0.0590 5 0.0400 11 2.0000 12 1.1000 19 0.3000 21 0.0018 38 0.0340 40 0.0120
 4810504 2 22 0.1800 42 0.0300 33 0.0800 56 0.2300
 4810504 2 22 0.3900 42 0.0260 23 0.0390 24 0.0072 56 0.2390

4810504 3 48 0.0005 50 0.0002 81 0.0141 83 0.0009
 4810504 4 22 0.2400 42 0.0450 11 2.0200 12 2.0000 19 1.6200 23 0.0400 24 0.0060 38 0.0020
 4820062 0 22 0.4900 42 0.0260 19 0.7300 38 0.0700 56 0.3600
 4320062 3 22 0.6200 12 1.4770 15 0.1832
 4820062 4 22 0.6200 12 1.3390 15 0.1964
 4820062 5 22 0.4200 12 1.7430 15 0.1135
 4820062 6 22 0.6200 12 8.5535

4920062 7 22 0.5300 42 0.0410 5 0.0260 11 2.7000 12 1.3000 19 0.6000 21 0.0003 23 6.0420 24 0.0009 38 0.0750 33 0.0130 40 0.0560
 4830006 0 22 0.5500 42 0.0360 19 0.5400 38 0.0910 56 0.4300
 4840004 0 22 0.8400 42 0.0360 12 1.7000 23 0.0390 81 0.0040
 4840004 1 50 0.0003 81 0.0090 93 0.0018

4840006 0 22 0.6300 42 0.0380 19 1.7100 38 0.0770 56 0.5700
 4840006 2 22 0.8900 15 0.3760 40 0.0130
 4840015 0 22 0.4400 12 1.4650 15 0.1353
 4960012 0 22 0.4000 11 2.2100 12 1.1200 19 1.0100
 4870010 0 22 0.6400 42 0.0093 23 0.0280 24 0.0025 56 0.1580

SEQ NO. Z WT:
 4870010 1 22 0.2800 38 0.1100 55 0.3000
 4870013 1 22 0.6800 42 0.0110 23 0.0450 24 0.0074 56 0.1250
 4870016 1 22 0.5100 42 0.0060 5 0.0300 11 2.2000 12 0.8000 19 0.7000 21 0.0019 23 0.0220 24 0.0013 38 0.0620 39 0.0100 43 0.0650
 4870018 0 22 0.7000 11 1.6000 12 1.6500 19 1.2100 56 0.9700
 5190054 0 22 0.5200 15 0.5360 40 0.0018
 5200002 0 22 0.7700 15 0.5600 40 0.0060
 ERROR NO REFERENCE B501

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FILE 5 ✓

This document provides a guide
to field contents/codes.

The format in which data
appear on your tape is
entirely different.

This documentation applies to
files:

MGG15995012-15

Not all files contain all data
types - please see individual
file descriptions.

SIO REFERENCE SERIES

SEDIMENT DATA BANK CODING INSTRUCTIONS

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Scripps Institution of Oceanography

Reference Number 78-9

SEDIMENT DATA BANK CODING INSTRUCTIONS

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PREFACE

This report explains how to code information for input to the SIO Sediment Data Bank. The Sediment Data Bank Users' Handbook, SIO Reference 78-10, describes the data bank and available types of output and includes instructions for data retrieval.

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A. STATION RECORDS

One Station Record is to be coded for each core, dredge or other sample. If seafloor photographs were taken in conjunction with other sampling, they are not coded as separate stations but information from the photographs is entered in Columns 52-53. If seafloor photographs were taken where no other sampling occurred, they are coded as separate stations.

Station Records are identified by the numeral "0" in the first column. The information is coded as follows:

<u>Columns</u>	<u>Item</u>	<u>Explanation</u>
1	0	Card number; identifies Stations record
2-8		Leave blank
9-14 15-21	Latitude Longitude	Latitude and longitude are expressed as degrees, minutes and tenths of minutes, right justified with decimal point omitted, followed by N, S, E or W.
22-23	Sampler Type	Coded as in Table 1. Omit if unknown.
24-28	Bathymetry	Water depth in meters, as reported in the data source (may be corrected or uncorrected). Enter as a right-justified integer.
29	Institution	Data collected from one of the institutions listed below is coded as indicated. For other institutions leave column blank. F = Florida State University H = Hawaii Institute of Geophysics L = Lamont-Doherty Geological Observatory O = Oregon State University R = Akademiiia Nauk, USSR S = Scripps Institution of Oceanography W = Woods Hole Oceanographic Institution
30-41	Station Name and Number	Identifies the station. Enter the cruise or ship name or an appropriate abbreviation and the station number or sample number, starting in Col. 30. May be up to 12 alphanumeric characters.
42-45	Reference	A letter followed by three digits to indicate the source of the information which is being coded. Each reference number is keyed to an item for which an entry has been made in the Bibliography File.

46-50	Length of Core	In meters. If decimal point is not entered, it is assumed to be at the right of Col. 50. For example, 140 m is coded as 140 or 140.; 231 cm is coded as 2.31.
51	Manganese Nodule Occurrence	Refers only to nodules collected by the sampler described in Cols. 22-23. If nodules were observed in seafloor photographs associated with the station, the information should be entered in Cols. 52-53, not here. Use the following codes: 0 or blank = unknown; no information 1 = nodules absent 2 = nodules present
52	Manganese Nodule Coverage	Code as follows: 0 or blank = no information 1 = no nodules 2 = sparse (<20% coverage) 3 = moderate (estimated 20-50% coverage) 4 = abundance (coverage estimated >50%)
53	Sampler Type From Which Coverage and/or Concentration Estimate Was Determined	Code as follows: 0 or blank = unknown 1 = box core or box grab 2 = photographs 3 = miscellaneous; other 4 = sonar 5 = television 6 = grab sampler 7 = coverage from photographs, concentration most likely from major sampler (Cols. 22-23)
54-58	Manganese Nodule Concentration	Seafloor concentration in kg/m ² . Enter as a real number to two decimal places; decimal point must be included.
59	Surface Nodules	Enter a "1" in this column if manganese nodules occurred within 10 cm of the sediment surface.
60	Buried Nodules	Enter a "1" in this column if manganese nodules occurred below 10 cm in the sediment. Both Cols. 59 and 60 may be filled if both buried and surface nodules were observed.
61-62	Surface Lithology	These codes are to give a general indication of the lithology of the surface sediment. They are not intended to constitute a comprehensive system of sediment classification such as described in Section C. If a sample does not fit into a category, do not code. Code as follows:

B. MANGANESE NODULE ANALYSES RECORDS

Manganese nodule records are identified by the digit "3" in column 1. Depending on the number of elements analyzed, there may be 3 or 4 cards for a single sample. Each subsequent card will be identified by the digits "4" and "5". Card number 5 may be used repeatedly as many times as necessary.

Card 3 is coded as follows:

<u>Columns</u>	<u>Item</u>	<u>Explanation</u>
1	3	Card number
2-4 5-8	Square number Sequence number	Square and sequence numbers are the same as on the Station Record which corresponds to the station from which the manganese sample was taken. Columns 2-3 should be completely filled; use leading zeroes.
9-10	Analysis number	Number analysis from 0-99 sequentially using a new number for each analysis.
11-12	Sample type	Enter the sample type according to the following code: 0 = unknown 1 = Mn nodule or nodules 2 = Mn nodule in sediment 3 = micronodules 4 = micronodules in sediment 5 = nodules and micronodules 6 = Mn-encrusted sediment 7 = Mn-coated rock 8 = crust, pavement 9 = Mn-coated organic material 10 = several crusts
13-27	Sample dimensions	Enter dimensions in millimeters (1 cm = 10 mm, 0.1 cm = 1 mm) as follows: 13-17 largest dimension or diameter 18-22 next largest dimension 23-27 smallest dimension You must right justify the number or include a decimal point in the dimension. If a range is given, enter the largest dimension in columns 13-17 and the smallest dimension in columns 23-27. If dimensions are in microns, you enter a minus sign (-) before the number in cols. 13-17.

4 = earbone
 5 = pumice
 6 = chert
 7 = palagonite
 8 = clay
 9 = altered basalt
 10 = volcanic
 11 = nodule fragment
 12 = metallic object
 13 = sediment, unspecified
 14 = rock, unspecified

34-37 Reference

A letter followed by three digits to indicate the source of the information being coded. Each reference number is keyed to an item for which an entry has been made in the Bibliography File.

38-72 Element concentrations (weight %)

Enter the concentrations for the following elements in the columns indicated:

38-42 Manganese (Mn)
 43-47 Iron (Fe)
 48-52 Cobalt (Co)
 53-57 Nickel (Ni)
 58-62 Copper (Cu)
 63-67 Zinc (Zn)
 68-72 Molybdenum (Mo)

If the concentration is more than 4 digits, there is an implied decimal point just before the left most column in the field. If you enter a number without a decimal point, it must be left justified. If you enter a number with a decimal point, it may be entered anywhere in the field.

73-80 These columns are to be left blank.

Card 4 is coded as follows:

<u>Column</u>	<u>Item</u>	<u>Explanation</u>
1	4	Card number. This card may be omitted if none of the information given below is given in the source.
2-4	Square Number	
5-8	Sequence number	Same as on Card 3
9-10	Analysis number	

Card 5 is coded as follows:

1	5	Card number
2-4	Square number	
5-8	Sequence number	Same as on cards 3 and 4.
9-10	Analysis number	
11-66	Additional element concentrations (weight %)	Enter concentrations in the same way as on Card 4 under Additional element concentrations. Atomic number fields begin in Cols. 11,18,25,32,39,46,53 and 60. If you have more element concentrations than the space provided on these three forms, card 5 may be used repeatedly until all elements are recorded.

DEPTH IN CORE. The depth below the seawater-sediment interface at which the sample analyzed was found is to be entered as a pseudo element concentration on either Card 4 or Card 5. The "atomic number" indicating depth is 93, and the depth in cm is entered as a right-justified integer under "element concentration." For a surface sample the depth is entered as zero (0).

67-80 These columns are to be left blank.

5	Calcareous ooze	$\text{CaCO}_3 > 30\%$, $< 25\%$ siliceous remains. Calcareous material is biogenous debris from foraminifera, pteropods, or nannofossils. Includes: globigerina ooze, foram ooze, pteropod ooze, foram marl ooze, foram marl, foram chalk, globigerina and foram mud.
6	Siliceous ooze	Pelagic sediments containing $> 30\%$ skeletal remains of siliceous organisms (radiolaria, diatoms, silicoflagellates, sponge spicules and echinoid spines).
7	Clay	Pelagic clay, having $< 30\%$ CaCO_3 , $< 30\%$ siliceous skeletons, $> 10\%$ slow sedimentation indicators (zeolites, Fe and Mn micronodules, fish debris); Terrigenous clay, having $< 50\%$ volcanic particles, $< 30\%$ CaCO_3 , $> 90\%$ clay-sized particles, $< 10\%$ slow sedimentation indicators.
8	Volcanic ash	Grain size < 4 mm, and 50% or more of the sample is of pyroclastic origin.
9	Siliceous-calcareous ooze	Biogenous sediments in which siliceous and calcareous biogenous material are each $> 25\%$. (Most sediments within this category contain enough CaCO_3 to be considered calcareous ooze, but many researchers find the indication of a large siliceous component useful).
10	Zeolitite	Sediment containing $> 50\%$ zeolites.

Our system was designed to facilitate digital coding of sediment descriptions from a variety of sources and to serve the needs of specific research groups. It is not meant to replace schemes in current use for classifying marine sediments. In most cases data included in the DESCRIPTIONS records allow the user to reclassify the sediments according to any system using our Program SEARCH (see SIO Reference No. 78-10). Such reclassification is, of course, impossible if the original source contained only the lithological category with no additional descriptive information.

Several classification systems are summarized below along with the Sediment Data Bank lithological name which corresponds to each major category in the other systems.

The scheme devised by Murray and Renard² includes ten major sediment categories as follows:

<u>Term used by Murray & Renard</u>	<u>Definition</u>	<u>Data Bank Classification</u>
Blue mud	Characteristically bluish gray; moderately coherent and granular; made up of land detritus, mainly quartz. Frequently found in deeper water surrounding continents.	Mud (may sometimes be classified as calcareous ooze if $\text{CaCO}_3 > 30\%$)

Noting several weaknesses in the above system, in 1944 Revelle⁴ proposed a new system of sediment classifications as follows:

<u>Term used by Revelle</u>	<u>Definition</u>	<u>Data Bank Classification</u>
I. Pelagic Deposits	Sediments of red, brown, yellow or white color which have below a certain amount of allogenic mineral and rock particles > 5 μm and which contain only small amounts of neritic organism remains	
A. Oozes	Skeletal remains of organisms >30% in amount	
Globigerina, Pteropod Coccolith Calcareous ooze	CaCO_3 >30%; skeletal remains of calcareous organisms >30%	Calcareous ooze
Siliceous Globigerina ooze	CaCO_3 >30%; abundant siliceous remains	Siliceous-calcareous ooze
Siliceous Diatom Radiolarian ooze	CaCO_3 <30%; skeletal remains of siliceous organism >30%	Siliceous ooze
B. Red Clay	Skeletal remains of organisms <30%	Clay
II. Terrigenous deposits, called muds	Distinguished by a bluish, green, gray or black color, or presence of appreciable neritic organic remains or allogenic minerals	
A. Organic muds	Skeletal remains of organisms >30%	
Calcareous mud and sand	CaCO_3 >30%; calcareous organisms or neritic type	Calcareous ooze
Globigerina, pteropod mud	CaCO_3 >30%; calcareous organisms of pelagic type	Calcareous ooze
Siliceous Diatom Radiolarian mud	CaCO_3 <30%; remains of siliceous organisms >30%	Siliceous ooze

Pelagic Sediments

Pelagic clay	<30% CaCO ₃ , <30% siliceous skeletons; slow sedimentation indicators (zeolites, Fe and Mn micronodules, fish bones, etc.) >10%.	Clay
Zeolite clay	Zeolites are dominant constituent	Zeolitite
Siliceous Radiolarian Diatomaceous } ooze	Soft; >30% siliceous skeletons <30% CaCO ₃ , <30% silt and clay	Siliceous ooze
Radiolarite Diatomite Chert Porcelanite }	Same as siliceous ooze but hard	Rock or gravel
Calcareous ooze	Soft; >30% CaCO ₃ , <30% silt and clay	Calcareous ooze
Chalk Indurated chalk Limestone }	Same as calcareous ooze but firm or hard	Rock or gravel

Transitional sediments

Muddy diatom ooze	Soft; >50% diatoms; >30% silt and clay; <30% CaCO ₃ .	Siliceous ooze
Muddy diatomite	Same as above but hard	Rock and gravel
Diatomaceous } mud Siliceous }	Soft; 10-50% diatoms; >30% silt and clay; <30% CaCO ₃ .	Siliceous ooze if diatoms >30%; otherwise, mud
Marly calcareous ooze	Soft, >30% CaCO ₃ , >30% silt and clay.	Calcareous ooze
Marly chalk Marly limestone }	Same as above but hard	Rock and gravel

Terrigenous and volcanic detrital sediments

Clay Mud Silt Sand }	Soft; <80% volcanic particles; <10% diatoms; <30% CaCO ₃ ; slow sediment indicators <10%. Sediments subdivided into textural groups according to the diagram in Fig. 1, page 22.	Clay, mud or sand and silt
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Radiolarian (diatom) chalk	5-30% siliceous microfossils; remainder is chalk	Calcareous ooze or siliceous-calcareous ooze depending on detailed description
Radiolarian (diatom) marl	5-30% siliceous microfossils, remainder is clay and silt	Clay
Coarse fraction 30-80%:		
Foraminiferal (pteropod) chalk ooze	30-80% coarse calcareous micro- fossils; remainder is chalk	Calcareous ooze
Foraminiferal (pteropod) marl ooze	30-80% coarse calcareous microfossils; remainder is marl	Calcareous ooze
Foraminiferal (pteropod) clay ooze	30-80% calcareous microfossils; remainder is clay and silt	Calcareous ooze
Radiolarian (diatom) chalk ooze	30-80% coarse siliceous microfossils; remainder is chalk	Siliceous or siliceous-calcareous ooze depending on detailed description
Radiolarian (diatom) marl ooze	30-80% coarse siliceous microfossils; remainder is marl	Siliceous or siliceous-calcareous ooze
Radiolarian (diatom) clay ooze	30-80% coarse siliceous micro- fossils; remainder is clay and silt	Siliceous ooze
Coarse fraction >80%:		
Foraminiferal (pteropod) ooze	>80% coarse microfossils, pre- dominantly foraminifera or pteropods	Calcareous ooze
Radiolarian (diatom) ooze	>80% coarse microfossils, predominantly radiolaria or diatoms	Siliceous ooze

The Kaneps report does not mention the classification of terrigenous sediments, but Lamont-Doherty uses the usual terms sand, silt and mud; we presume they have the same meaning here as in other systems.

2 = definitely present. This code is used only for incomplete descriptions in which the actual quantity of microfossils is either not supplied or cannot be understood.

3 = rare or trace amounts, probably <10%. Includes such categories as "few" (usually 5-15%) and "negligible" and DSDP categories "trace" (<2%) and "bearing" (2-10%).

4 = low, probably 10-30%. Usually the abundances of the constituents have been estimated and listed in the description. Includes samples described as "Foraminiferal" or "Radiolarian" clay.

DSDP core describers may add the prefix "rich" to the sediment name if constituents are present in amounts of 10-25%.⁸ Although DSDP descriptions always list the estimated percentages or abundance, the coder may encounter descriptions from other sources where the sediment was described as, for example, a foram-rich clay, which would be included in this category. At SIO a sediment name is prefixed by the term "bearing" for a comparable range of 5-25% (personal communication, Carolyn Glockhoff).

For DSDP and SIO, major constituents present in quantities greater than 25% provide the sediment name. Constituents are listed in order of increasing abundance from left to right. The coder can use the number of sediment names to estimate abundances. For example, a sample may have the assigned lithology "Foram, clayey, nanno ooze." The first item of three is probably less abundant than 30%; thus Forams would be in the 10-30% range. The second constituent would be likely to fall in the 30-50% range, but probably toward the lower boundary of this category. The nannofossils could also be assumed to be present in the 30-50% range, though being present in the greatest abundance they could be assumed to be in the higher end of the range.

Occasionally specimen abundances are given in terms of individuals per gram of sediment. In order to determine the percentage equivalent one must have specific knowledge of both the specimens and the region. An example would be diatoms in the Bering Sea, where 100,000 to 200,000 diatoms per gram sediment would constitute between 10 and 30%, but this cannot necessarily be applied to other regions because of variance in specimen size (personal communication, Edith Vincent, SIO).

5 = moderate, probably 30-60%. This category would include those samples described as foraminiferal or pteropod marl ooze in the Olausson or Kaneps classification systems. SIO observers require that more than 50% of the sediment consist of biogenous remains before the sediment is called an "ooze" (personal communication, Carolyn Glockoff). A "biogenous ooze" may be dominated by one skeletal type, or it may be a composite. In the latter case, the abundance of any one organism is likely to be in the low or moderate range.

6 = probably >30% and possibly >60%. This category is used when the sample is classified as "ooze" according to a system where ooze is defined as a sediment containing >30% microfossils and no further information is available.

25	Consolidation	Code as follows:
		0 or blank = soft or not specified, un-consolidated
		1 = soupy, semi-liquid
		2 = firm, stiff, or partially indurated
		3 = hard, indurated

The presence of minerals and other features in the sample is indicated by the numeral "1" and their absence by a blank or "0" in the appropriate column:

26	Turbidite	
27	Bedded	Laminated, stratified, varved, evidence of cross-bedding
28	Graded	
29	Worm Burrows	
30	Mottling	Cannot be specifically identified as burrows
31	Volcanic Ash Layer	Ash layer within the layer of core being described
32	Dispersed Volcanic Ash	Accumulations of glass shards constitute volcanic ash.
33	H ₂ S	Hydrogen sulfide gas
34	Manganese Pavement or Crusts	
35	Manganese Nodules	Includes samples described as concretions
36	Manganese Micronodules	Generally silt or sand-sized. Do not place a "1" in this column if the description reports merely "manganese test positive."
37	Quartz	
38	Feldspar	Includes plagioclase and orthoclase
39	Pyroxene	Includes hypersthene and augite
40	Chlorite	
41	Mica	Includes muscovite and biotite. Mica is usually a terrigenous sediment component; however, muscovite can be authigenic.
42	Glass	
43	Palagonite	
44	Glauconite	A component of "green mud" or "green sand." It is an indicator of very slow sedimentation.

4 = mud. See classification schemes in Section C-1 for various definitions of this term. It is always a terrigenous sediment, generally of mixed grain size. Data bank coders should follow DSDP definition (Fig. 1) if possible.

5 = calcareous ooze

6 = siliceous ooze

7 = clay. May be pelagic or terrigenous. Pelagic clay is fine-grained with indicators of slow sedimentation $\geq 10\%$, $<20\%$ terrigenous detrital material in the coarse fraction or $<30\%$ in the total sample, CaCO_3 or siliceous microfossils $<30\%$; includes sediments described as lutite. Terrigenous clay is a terrigenous sediment with $\geq 90\%$ clay-sized fraction.

8 = volcanic ash

9 = siliceous-calcareous ooze. Includes samples with $>30\% \text{ CaCO}_3$ and "appreciable" amounts of radiolaria or diatoms.

10 = zeolitite

Part 2 of the Description Record is identified by the numeral "2" in Column 1 and is coded as follows:

<u>Columns</u>	<u>Item</u>	<u>Explanation</u>
1	2	Card number; identifies second part of Description Record
2-10	Square Number Sequence Number Layer Number }	Same as for Card 1
11-16	Top of Layer	The depth below the sediment-water interface, in centimeters, at which the layer being described begins. The top layer may or may not begin at zero.
17-21	Layer Length	The depth of the top of the layer, in centimeters, subtracted from the depth of the bottom of the layer
22-24 25-27	Predominant Color Secondary Color }	Colors are expressed by a 3-character code condensed from the Munsell system. The first character of each color code represents the <u>hue</u> :

R = red (R in Munsell code)

O = orange or yellow-red (YR 1/ to YR 5/)

Y = yellow (2.5Y)

G = green, yellow-green or olive (7.5Y, 10Y, GY, B, BG)

B = blue or purple (B, PB, P, RP)

N = neutral (black, white or gray: N)

T = tan or light yellow-brown (2.5Y6/ to 9/ or YR6/ to 9/)

TABLE 3: MODIFIERS FOR ROCK AND PEBBLES

Code	Modifier
IGN	Igneous, unspecified
BAS	Basalt, pillow basalt, basalt glass
GAB	Gabbro, diabase
PUM	Pumice
BRE	Breccia, volcanic
VOL	Volcanic, unspecified
TUF	Tuff
AND	Andesite
GRA	Granite
PER	Periodotite
MET	Schist, or unspecified metamorphic
GRE	Greenstone
SER	Serpentine
SED	Sedimentary, unspecified
SAN	Sandstone, graywacke
MUD	Mudstone, siltstone, claystone, shale
CON	Conglomerate
LIM	Limestone
CHA	Chalk
CHE	Chert, porcelanite
EVA	Evaporite -- gypsum, salt
MNN	Mn nodules
MNP	Mn pavement or crust
MNC	Mn-coated
COR	Coral
PHO	Phosphorite nodules
ZE0	Zeolite nodules
GLA	Glacial transport material
SHE	Macrofauna shells
ALT	Altered
FER	Ferruginous
SIL	Siliceous